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**BONDS OR LOANS?**  
**THE EFFECT OF MACROECONOMIC FUNDAMENTALS**

**By**  
**Galina Hale**

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# Bonds or Loans? The Effect of Macroeconomic Fundamentals\*

Galina Hale

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September 2005

## Abstract

The costs of debt crises are not invariant to the foreign debt instrument composition: bank loans or bonds. The lending boom of the 1990s witnessed considerable variation over time and across countries in the debt instrument used by emerging market (EM) borrowers. This paper tests how macroeconomic fundamentals affect the composition of international debt instruments used by EM borrowers. Analysis of micro-level data using ordered probability model shows that macroeconomic fundamentals explain a significant share of variation in the ratio of bonds to loans for private borrowers, but not for the sovereigns.

JEL classification: F34

Key words: emerging markets, foreign debt, debt composition, country risk

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\*Contact: Department of Economics, Yale University, PO Box 208268, New Haven CT 06520-8268, galina.hale@yale.edu. I am most grateful to Barry Eichengreen for guidance and encouragement, to many colleagues and conference and seminar participants, especially Eduardo Engel, Gita Gopinath, Olivier Jeanne, Richard Lyons, and Maury Obstfeld for insightful feedback. Andrew Scott and two anonymous referees provided most helpful comments and suggestions. This research would have been impossible without Ashoka Mody's generosity in providing bond and loan data, and without the instrumental help of Himmat Khalsi and E.J. Kim. Oxana Marmer and Yvonne Chen provided excellent research assistance. I am grateful to the Department of Economics at UC Berkeley, Berkeley Program for Soviet and Post-Soviet Studies and YCSGs for financial support. All errors are mine.

# 1 Introduction

During the lending boom of the 1990s, unlike in the past, emerging market (EM) borrowers — public as well as private — borrowed heavily from foreign banks and also actively issued international bonds. The decade witnessed considerable increase of borrowing on both of these markets, but also a considerable variation over time and across countries in the ratio of these two debt instruments.<sup>1</sup>

The goal of this paper is to analyze how macroeconomic fundamentals affect this variation in the use of foreign debt instrument, a question that has not been addressed much in the literature.<sup>2</sup>

It is important to understand what makes EM borrowers rely more on one debt instrument versus the other because emerging markets are prone to debt crises and the costs of these crises depend on the instrument that the country primarily relies upon. Both instruments have advantages and disadvantages when it comes to restructuring of the debt.<sup>3</sup> The disadvantage of bond debt has been emphasized in the IMF proposals to reform international financial architecture:

When faced with a restructuring, individual creditors, unlike banks, have more incentives to hold out for the best possible terms, or to sue for better terms. Also, disagreement over the relative treatment of different types of creditors are more likely.<sup>4</sup>

Simple statistics show that the countries with highest proportion of bonds in their external debt stock take on average about twice as long to reschedule their debt as the countries with lower proportion of bonds.<sup>5</sup> It is not clear, though, whether more difficult restructuring is necessarily a

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<sup>1</sup>See Data Appendix for the details and data description.

<sup>2</sup>One exception is Buch (2002) that analyzed the effects of macro variables on bilateral bond and bank loan flows among five of the G-7 countries using a gravity model.

<sup>3</sup>See Truglia, Levey, and Mahoney (1995) for the discussion of relative costs of restructuring bonds and bank loans.

<sup>4</sup>“Proposals for Sovereign Debt Restructuring Mechanism (SDRM): A Factsheet” can be found on the Internet (<http://www.imf.org/external/np/exr/facts/sdrm.htm>).

<sup>5</sup>See Appendix 1.

bad thing. Dooley (2000) argues that a higher cost of defaults makes it less likely that sovereigns will choose to repudiate their debt. As a result, we should expect the debt crises to be more frequent in countries that rely primarily on bank lending. The chance of a liquidity crisis can also be higher in this case because loan contracts frequently carry covenants that allow banks to discontinue their financing on relatively short notice. These covenants can also contribute to the spread of financial “contagion,” as we have witnessed during the Asian crisis in 1997-98.

These differences should be taken into account when (re-)designing international financial architecture and, in particular, the role of international financial institutions. In an important step in this direction, Eichengreen, Kletzer, and Mody (2005) find that IMF supervision is much more important for the bond market than for bank loans, mainly due to the fact that banks themselves engage in supervision and monitoring through repeated lending to the same borrowers.

But what makes countries rely primarily on bond market rather than bank loans for their external funding in the first place? More specifically, what is the relationship between the composition of external debt instruments and macroeconomic fundamentals, which are themselves a focus of international financial institutions’ policy recommendations? This paper, by answering these questions, contributes to the debate on international financial architecture, without taking a stance in a normative discussion of whether the bond market or the banks represent a more preferable way to borrow.

Since the relationship between macroeconomic fundamentals and the debt instrument is not an obvious one, the paper first summarizes relevant theoretical literature. The framework in Diamond (1991) and its static version in Hale (2001) generate clear empirical implications and are therefore used as a stepping stone for the empirical analysis.<sup>6</sup> The main implications of the model associate the composition of debt instruments with riskiness of the borrower.

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<sup>6</sup>See a review of this and other theories in Hale and Santos (2004).

Given that the question of this paper is the effect of macroeconomic fundamentals on the foreign debt instrument composition, it focuses on country risk. Country risk is more relevant for the EM borrowers than for those in the industrialized countries (Morck, Yeung, and Yu 2000). For this reason, and because the issue is much more relevant for the EM borrowers, this paper focuses on emerging markets. Since country risk affects foreign and domestic lenders differently, the analysis is limited to foreign borrowing. Thus, the results are only relevant to the instrument composition of the *foreign* debt.

The empirical analysis utilizes micro-level data in order to control for changes in borrowers composition. The data set is made of individual bond issues and loan contracts. Nevertheless, this paper does not focus on the effects of firm characteristics, due to firm data limitations and because this relationship has been explored in corporate finance literature, most recently in Datta, Iskandar-Datta, and Patel (1999), Denis and Mihov (2003), Hale and Santos (2004) and Krishnaswami, Spindt, and Subramaniam (1999).<sup>7</sup> Data on bond issues and loan contract by EM public and private borrowers during the 1990s are analyzed using a discrete choice model.

The analysis confirms that macroeconomic factors such as the debt service to exports ratio, the degree of the real exchange rate appreciation, the volatility of exports, and the history of sovereign debt rescheduling, among others, affect debt instrument composition in an expected direction. The results also show that macroeconomic fundamentals explain a large share of variation in the ratio of bonds to loans for private borrowers: 26% of the cross-country variation and 4% of the time variation. The effects of macroeconomic fundamentals are also economically significant: for example, for private borrowers Brady-type debt rescheduling in the preceding year increases the

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<sup>7</sup>These studies found support for the reputation-building predictions of Diamond's model and moral hazard, but only limited evidence of adverse selection. They also showed that firm credit quality is an important determinant of debt instrument, which is consistent with the findings of this paper.

probability of issuing a speculative grade bond (rather than taking a loan or issuing an investment grade bond) by at least 0.16, an increase in the debt service to export ratio by one standard deviation raises the probability of issuing a speculative grade bond by about 0.05.<sup>8</sup>

For the sovereign borrowers, macroeconomic factors do not seem to explain well the variance in the debt instrument composition, suggesting that other effects are more important in determining the debt instrument composition for the sovereigns. Nevertheless, some of the variables used do have large effects: Brady-type debt rescheduling in the preceding year increases the probability of issuing a speculative rating bond (rather than taking a loan or issuing an investment grade bond) by 0.29, an increase in the debt service to export ratio by one standard deviation raises the probability of issuing a speculative grade bond by about 0.07, an increase in export volatility by one standard deviation raises the probability that a sovereign issues a speculative grade bond by about 0.06. As expected, the effects for other public borrowers are in-between those obtained for private firms and for the sovereigns.

This paper relates to a number of empirical studies. Demirguc-Kunt and Maksimovich (1996), Domowitz, Glen, and Madhavan (2001), Schmukler and Vesperoni (2000), to name just a few, analyze EM debt-equity composition, debt maturity structure and other characteristics of capital flows to EMs. Folkerts-Landau (1985) and Aerni and Junge (1998) describe institutional features of international bond and loan markets. Both international bond market and the syndicated loan market have been treated in isolation,<sup>9</sup> however, there has been little systematic attempt to analyze the two markets in an integrated fashion: exceptions are Kamin and Kleist (1999) and Eichengreen, Kletzer, and Mody (2005).

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<sup>8</sup>These numbers are large — they represent the change in probability which is bounded between 0 and 1.

<sup>9</sup>On the pricing of international bonds, the literature goes as far back as Edwards (1986). On pricing and availability of international bank loans, see Eichengreen and Mody (2000a).

The paper proceeds as follows. Part 2 briefly presents theoretical considerations that motivate econometric approach and describes the estimation methodology. Part 3 discusses the choice of explanatory variables, describes data sources and sample characteristics. Results and robustness tests are presented and summarized in Part 4. Part 5 concludes.

## 2 Theoretical considerations

The theoretical literature on the structure of corporate debt is quite broad and it includes the analysis of intermediated versus market debt. However, Diamond (1991) and Rajan (1992) remain the main references on the determinants of the debt instruments the firms rely upon. Diamond's argument is built on the asymmetric information about a firm that gives rise to both moral hazard and adverse selection. Rajan (1992), on the other hand, focuses on the hold up problem associated with bank lending, which arises due to a bank's informational advantage once it initiates a relationship with a firm. This provides additional rationale for the extra cost that is associated with bank lending that is crucial in Diamond's model. While Diamond refers to this additional cost as a cost of monitoring, the interpretation can easily be extended to include a hold-up cost. In this sense the two models are complementary.

There are, of course, other models that add to our understanding of differences between bank and bond lending. In particular, Bolton and Freixas (2000) consider equity as well as bonds and bank loans and base their analysis on the asymmetric information and relative seniority of different instruments. They show, among other things, that if the supply of loans is large, equity will disappear and high-risk firms will borrow from banks while low-risk firms will issue bonds. This result is consistent with a special case of a Diamond's model, when moral hazard is absent. This model, as well as other theories are reviewed in some detail in Hale and Santos (2004).



For the purpose of analyzing EM foreign debt, Diamond's model seems most appropriate for three reasons. First, moral hazard and adverse selection associated with asymmetric information are pervasive both for sovereign debt and for lending to large EM firms. Second, while portfolio equity flows to EM firms became much more important recently, in the beginning of the 1990s they were still quite scarce. And, obviously, equity is not relevant for sovereigns' financing decisions. Finally, relative seniority of bonds and bank loans on international capital markets is not always specified *de jure* and varies on a case by case basis.

It is important to point out that all these theories assume that a borrower is choosing a debt instrument in a way that is minimizing the cost of funds. As such, these theories might not be applicable to sovereign borrowers that may have additional objectives when choosing debt instrument.<sup>10</sup> Therefore, we should not necessarily expect the model to work for the sovereigns. The test presented later in the paper will show that, indeed, the model predictions are not supported by the data in the case of the sovereigns.<sup>11</sup>

## 2.1 Intuitive model description

Diamond (1991) presents a dynamic model in which monitoring and loan cancellations, but not renegotiations are allowed. In the model there are three types of borrowers: safe, risky, and those subject to moral hazard. These types are not observed by lenders, however lenders know the share of each type in the borrowers' population. The borrowers that are subject to moral hazard choose between a safe and a risky project, while lenders choose whether to monitor the borrowers. When

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<sup>10</sup>Sovereigns may have political reasons to disperse their debt among many borrowers, they also might have to follow suggestions from international financial institutions. As Broner, Lorenzoni, and Schmukler (2004) show, risk and maturity may also be important.

<sup>11</sup>While the assumption that a sovereign's only objective is to minimize their borrowing cost might be acceptable in a variety of settings, it does not seem to be most appropriate when analyzing the choice between bonds and loans.

the lender chooses not to monitor the borrower, the borrower prefers to issue a bond, instead of paying banking fees.<sup>12</sup>

Lenders' decision to monitor or not depends on the probability that they are facing each type of borrowers and on the action the "switching" type would choose. Thus, the instrument that borrower ends up with depends on the distribution of types in the population the borrower is coming from, which can be thought of as a borrower's expected creditworthiness. In particular, as creditworthiness improves, borrowers are likely to switch from speculative grade bonds (represented by the case with no monitoring and the choice of a risky project in Diamond's model) to bank loans. As creditworthiness improves further, borrowers switch back to the bond market, this time issuing investment grade bonds, reflecting the now lower level of risk.<sup>13</sup> This cost is determined by the risk level of the borrower and in turn determines which instrument is cheaper for a given risk level. The borrower is then assumed to choose a cheaper instrument. Thus, equation (1) represents the equilibrium outcome regarding the debt instrument that a borrower with rating  $\rho$  will end up using. Note that the structure of the model is such that no borrower can choose between investment grade bond and speculative grade bond. The risk level determines the instrument that the borrower will use — for lower risk borrowers the choice is between investment grade bonds and bank loans, while for higher risk borrowers the choice is between speculative grade bonds and bank loans.

The intuition behind this result is that endogenous reputation works as an enforcement mechanism

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<sup>12</sup>While Rodrik and Velasco (2000), Jeanne (2000), Broner, Lorenzoni, and Schmukler (2004) argue that in practice bond holders can also monitor the borrower and punish those that misbehave by refusing to purchase new issues, this is only relevant for short-term bonds. In our sample, median maturity of the bonds is 5 years.

<sup>13</sup>The cost of debt does not enter this reduced form relationship directly, but is implicit in it. In the estimation, the spreads are not included mainly due to the fact that they are never observed for the alternative that is not chosen. In addition, they are not available for a majority of observations and not directly comparable between bonds, that are mainly fixed rate, and loans, that are predominantly floating rate.

for low risk borrowers, since they are very interested in preserving this good reputation, which eliminates the need for monitoring. At the other extreme, borrowers whose reputation is already very poor face very low reputation costs and even monitoring will not help them overcome the moral hazard. The borrowers with moderate risk level, however, benefit from the incentives imposed by bank monitoring due to some probability that they can be “caught” undertaking risky projects.

The static version of the model presented in Hale (2001) shows that even without differentiated reputation costs, the above result holds as long as we assume there are adverse selection, moral hazard and a fee for banking intermediation (monitoring cost in Diamond’s framework or hold-up cost in Rajan’s). This model assumes exogenous costs of default and loan cancellation that are the same for all borrowers and are not necessarily linked to reputation, but have to be positive to sustain borrowing. In this model as well, the main prediction (which will be used in the empirical analysis that follows) is that *the most risky and the least risky borrowers issue bonds while the moderately risky borrowers rely on bank lending.*

An alternative intuition for this result lies in the different characteristics of bonds and bank loans. Banks can refuse to roll-over the loans, which represents a credible threat to a borrower and therefore makes monitoring efficient.<sup>14</sup> In contrast, after the launch of an international bond, bondholders have little control over the issuer’s actions, since a bond issue cannot be reversed before it matures (bond maturity was on average 5 years for EM bonds in the 1990s). These facts suggest that banks can limit the risk of their loans and, hence, offer funds at a lower rate.

However, these advantages come at a cost. Banks bear costs not borne by bond holders, including reserve and capital requirements, as well as operating and monitoring costs, that they pass through to their borrowers. Hence, borrowers face a trade-off between the lower risk premium and additional costs of bank loans as compared to bonds.

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<sup>14</sup>Most loan contracts considered in the empirical analysis provide for bi-annual loan roll-over.

This trade-off is resolved differently for different borrowers. At the low end of the risk spectrum, borrowers do not need to be monitored. For these borrowers, the costs of financial intermediation outweigh its benefits and they choose to use the bond market, which is able to provide funds at a lower cost than banks. For moderate-risk borrowers, monitoring can be efficient in reducing the risk of a loan. The costs of financial intermediation are then outweighed by the reduction in the risk premium, which makes bank loans cheaper than bonds. For high risk borrowers, adverse selection is important: If the bank cannot significantly reduce the risk of a loan, as will be the case with the most risky borrowers, it will charge higher rates than the bond market, due to its additional costs. In a situation of asymmetric information, interest rates become too high for the low-risk borrowers, and the market disappears due to adverse selection *à la* Stiglitz and Weiss (1981).

Critically, because of the additional costs of banking activity, the market for bank loans disappears at a lower risk level than does the bond market. In other words, safe projects get priced out of the loan market for a larger set of cases than they get priced out of the bond market. As a result, we expect *the most and the least risky borrowers to issue bonds, while those of the moderate riskiness rely primarily on bank loans*. The most risky borrowers issuing bonds will pay high risk premium, therefore it is natural to think about these bonds as high-yield speculative grade bonds.

## 2.2 Testable implications

The relationship between the risk level and the debt instrument described above is illustrated in Figure 1.<sup>15</sup>

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<sup>15</sup>This figure and the discussion that follows do not take into account the prediction that most risky borrowers will not be able to borrow at all. Since no information about those that applied for a loan and did not receive it or failed to issue a bond is available, it is not possible to take them into account. Even if it would be possible to include observations on those that did not borrow — which is easy to do for sovereigns, one would have to separate those who did not need to borrow from those who tried and failed, which does not seem to be possible given the data available.

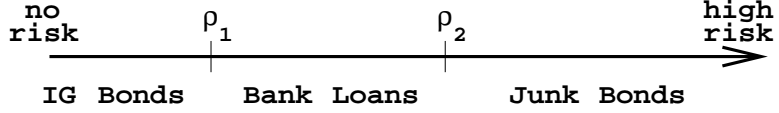


Figure 1: Risk and debt instrument

If we denote as  $y$  an instrument that each borrower uses, the model predictions can formally be summarized as follows:

$$y = \begin{cases} \text{IG bond} & \text{if } \rho < \rho_1 \\ \text{Bank loan} & \text{if } \rho_1 \leq \rho < \rho_2 \\ \text{SG bond} & \text{if } \rho_2 \leq \rho \end{cases} \quad (1)$$

where  $\rho$  is a risk level as perceived by the lenders and  $\rho_1, \rho_2$  are relevant threshold values that can be estimated.

Clearly, the risk level of the borrower cannot be perfectly observed. However, we can observe the variables that might affect the risk level of a borrower, and can therefore represent the above model as an ordered probability model with unknown threshold values and latent variable  $\rho$ , which can be estimated by maximum likelihood. The variables used to estimate risk level and the details of estimation procedure are described below.

### 2.3 Estimation methodology

As described above, the model's predictions can be represented by an ordered probability model with unknown thresholds, where a dependant variable is an indicator of the instrument used by the borrower in each particular case, equation (1). In this set-up  $\rho$  can be interpreted as a latent variable that depends on a linear combination of explanatory and control variables described in a

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Thus, the results should be interpreted as conditional on borrowing overseas. Additional tests were conducted in Hale (2001) to account for the possible selection bias using data aggregation and panel tobit estimation. The results are qualitatively the same, while estimation is computationally demanding which prevents from conducting all necessary robustness tests.

next section. Specifically, for country  $i$  in quarter  $t$ , observation  $n$ ,

$$\rho_{itn} = Y_t' \gamma + X_{it}' \beta + Z_{itn}' \nu + \varepsilon_{itn},$$

where,  $Y$  is a matrix of global variables,  $X$  is a matrix of country-specific variables, and  $Z$  is a matrix of bond/loan specific variables.  $\varepsilon$  is assumed to be i.i.d. across observations and is usually assumed to be drawn from either normal or logistic distribution.<sup>16</sup>

The log likelihood function for each observation in this model is

$$\begin{aligned} \mathcal{L}_{itn} = & 1(y = \text{IG bond})[\log F(\rho_1 - (Y_t' \gamma + X_{it}' \beta + Z_{itn}' \nu))] \\ & + 1(y = \text{Bank loan})[\log (F(\rho_2 - (Y_t' \gamma + X_{it}' \beta + Z_{itn}' \nu)) - F(\rho_1 - (Y_t' \gamma + X_{it}' \beta + Z_{itn}' \nu)))] \\ & + (1 - 1(y = \text{IG bond}) - 1(y = \text{Bank loan}))[\log(1 - F(\rho_2 - (Y_t' \gamma + X_{it}' \beta + Z_{itn}' \nu)))] \end{aligned}$$

Since some countries were much more active on the international debt market than others, the data set has different numbers of observations for different countries in different quarters. Thus, in estimation, the countries that borrowed heavily will disproportionately affect the results of estimation. To balance the regression and allow for comparison across samples, importance weights are assigned to each observation in such a way that each country in each quarter has the same importance in the estimation, separately for each ownership sector (private, public or sovereign).<sup>17</sup>

Moulton (1990) showed that using aggregate data to explain micro-level variables can bias standard errors downward. To control for this effect, robust standard errors clustered by country and quarter were calculated.

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<sup>16</sup>Note that a constant is not included in the equation, as it cannot be identified separately from thresholds. See, for example Ruud (2000), page 759.

<sup>17</sup>For example, in the first quarter of 1992, the Argentinean private sector appeared in the data set 10 times — 7 loan contracts and 3 speculative grade bond issues. Thus, the weight attached to each of these observations is 0.1.

### 3 Explanatory variables and the data

Theory predicts a relationship between default risk and the debt instrument a borrower will rely upon. For majority of EM borrowers default risk is the only relevant one, since generally they do not borrow in their own currency, but rather in a currency of majority of their lenders,<sup>18</sup> which eliminates currency risk for the lenders. While majority of bonds and loan contracts are denominated in US dollars, some are denominated in other currencies. Therefore, a set of dummy variables to control for possible effects of currency denomination of bonds and loans is included in all regressions.

In this paper the focus is on the relationship between macroeconomic fundamentals and the debt composition. For sovereign borrowers, country default risk, which is affected by macroeconomic conditions and policies, is the only relevant risk, once we abstract from the currency risk. For private and non-sovereign public borrowers from the EMs, default risk consists of two components: a company's idiosyncratic risk and a country risk. It has been shown in the finance literature that for EM firms country risk is more important than a firm's idiosyncratic risk (Morck, Yeung, and Yu 2000). Thus, concentrating on EM firms (rather than firms in OECD countries) allows us to focus more squarely on the relationship between debt instrument composition and macroeconomic fundamentals.

That said, it is still necessary to control for idiosyncratic risk. While data on individual borrowers is limited, the composition effects of idiosyncratic risk are controlled for by including the US dollar equivalent amount borrowed and a set of dummy variables for the broadly defined industrial sector of a borrower, in addition to the currency denomination of the debt. An implicit assumption in

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<sup>18</sup>See Eichengreen, Hausmann, and Panizza (2002) for a description of this phenomenon. Exceptions are Hong Kong (which had a currency board), Malaysia, Singapore and Taiwan, where over half of bank loans, but not bond issues, were denominated in local currency.

what follows is that the rest of the idiosyncratic risk component, included in an error term, is orthogonal to country risk and therefore, does not present an econometric problem.

According to previous studies (Eichengreen, Hale, and Mody 2001, Eichengreen and Mody 2000b, Eichengreen and Mody 2000a, Kaminsky, Lizondo, and Reinhart 1998, Mody, Taylor, and Kim 2001), the following macroeconomic fundamentals have important effects on country default risk (measured either as probability of financial crisis or through risk premium incorporated in sovereign and private bond and loan spreads):

- *Real economy*: rate of growth of the real GDP and industrial production should both have a negative effect on the risk level in the long run, since they improve the probability of debt repayment for private borrowers through higher profits and for sovereigns through higher tax revenues;
- *Foreign position*: the ratio of foreign debt to GDP, the ratio of debt service to exports, the ratio of short-term to total debt, export volatility, real exchange rate appreciation, and the current account deficit, should each have a positive effect on the risk level because they all reflect higher vulnerability to external shocks. The ratio of foreign reserves to short-term debt, to imports or to M2 should have a negative effect on country risk due to lower probability of a currency crisis;
- *Monetary and financial sector*: the growth rate of domestic credit, the inflation rate, and the domestic short-term real interest rate, all indicating budgetary problems and thus reducing the probability that sovereign will be able to service the debt, should each have a positive effect on the country risk level; while an increase in the domestic stock market index should have a negative effect as it reflects expected improvement in fundamentals.

All of these variables can potentially affect the debt instrument composition through their effect



on country risk. They are all interrelated and therefore cannot be included simultaneously as explanatory variables due to high collinearity (for example, the growth rate of real GDP can be explained to a large extent by a combination of the other variables). Therefore, a more parsimonious specification is adopted in what follows.<sup>19</sup>

How risky a borrower is can be measured by, *inter alia*, its credit rating. Individual borrowers' credit ratings are available only for a small subset of the private borrowers and therefore, cannot be used. Instead, each country's credit rating from Institutional Investor is used as a proxy.<sup>20</sup> But the sovereign credit rating is affected by macroeconomic variables that are interesting to consider as explanatory variables. A credit rating residual (purged of the effects of the obvious macroeconomic variables as described in Appendix 2), and not the credit rating itself, is used as an explanatory variable,<sup>21</sup> in order to determine the total effect of macroeconomic variables on borrowing decisions, and not just the direct effects for a given credit rating.

In addition, the following global variables are found in previous studies (Mody, Taylor, and Kim (2001), among others) to affect capital flows to EMs: US GDP growth, the Emerging Market Bond Index (EMBI), the US swap rate and the US high-yield spread (as proxies for risk aversion). Again,

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<sup>19</sup>The variables are chosen to minimize collinearity and maximize interpretative power as well as maximize the number of non-missing observations. For instance, using the ratio of current account to GDP would be informative, but this variable is unavailable for about half of the sample and thus is omitted. Section 4.2 describes the results of other specifications, as robustness tests.

<sup>20</sup>Institutional Investor ratings were chosen for two reasons: they have by far the best coverage for 1991-99 period, and they provide scores on the continuous 0-100 scale at regular time intervals — twice a year. The last rating before a bond issue or loan contract date was used.

<sup>21</sup>Institutional Investor rating is constructed by surveying investors. As such, this credit rating represents investors' assessment of the country risk. When purged of all the effects of macroeconomic characteristics, it proxies for all factors that matter to investor but are not observed by an econometrician. The second stage, ordered probit, standard errors are corrected for the fact that the residual from the first stage is used.

they cannot all be utilized in the same specification due to high degree of collinearity.

Since the data on the history of individual borrowers' defaults is not easily available, sovereign default data is used. A variable is constructed for each country that is equal to one if a country had debt rescheduling in the past year, and zero otherwise. Since Brady-Type debt rescheduling operations created a market for guaranteed bonds, as well as reduced the debt burden, they could have a different effect than other debt rescheduling operations. Thus, separate variables for Brady-type and non-Brady-type debt rescheduling are used.

The theory also predicts that a higher opportunity cost of lending will reduce total lending but raise the share of bank loans. The 10-year US Treasury bond rate was used to proxy for the opportunity cost of lending.

### 3.1 Data sources

The data on bond issue dates, amounts, currency denomination, ownership and industrial sector of an issuer were gathered from Bondware. All international bonds placed internationally between 1991 and 1999 by EM borrowers were included.<sup>22</sup> Bonds issued by firms with headquarters in developed countries were excluded from the sample. For the bonds issued through off-shore centers, true nationality of the borrower was traced by the location of their headquarters. The initial set of bond issues includes 58 countries and 3757 bond issues, out of which about two thirds are by private firms, and the rest is evenly split between sovereign issuers (central governments and central banks) and other public borrowers (including government-owned enterprises as well as local and municipal authorities).<sup>23</sup>

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<sup>22</sup>See Data Appendix for the list of countries and detailed data description.

<sup>23</sup>As a sensitivity analysis, local and municipal authorities were reclassified as sovereigns. This did not affect the results.

Since the model predicts three alternatives — investment grade bonds, bank loans, and speculative grade bonds — while the data provide only information on bonds and loans, it is useful to split the observed bonds into an investment grade subgroup and a speculative grade subgroup. This is done by using individual bond ratings when available, using sovereign ratings for sovereign bonds and also for private bonds, according to the “sovereign ceiling” practice.<sup>24</sup> The rest of the bonds are classified based on the predicted probability of having an investment versus speculative grade, which is derived from fitting a probit equation for the bonds that are already classified. Due to some missing explanatory variables in the probit regression, only 3078 bonds are classified in the end, the rest are dropped from the sample. As a result of classification, about two thirds of the bonds turn out to be speculative grade, and the rest are investment grade. The details of the classification procedure, probit regression, and validity test results are presented in Appendix 3.

The data on foreign loan contract signing dates, amounts, currency denomination, ownership, and industrial sector of a borrower were collected from Loanware. For the 1991-99 period, the data set includes 12696 foreign banks loans, which are predominantly syndicated, extended to borrowers in 74 developing countries.<sup>25</sup> Just as with bonds, two thirds of the loans are extended to private borrowers. However, the majority of remaining loans are by public borrowers, with only 429 loans extended to sovereigns. Although this accounts for only about 3% of all loans, they are distributed between 53 different countries, so we are still able to analyze sovereign borrowers’ debt composition.

Since each observation is a bond issue or a loan contract, the data set does not represent a panel and is treated as a cross-section. It is combined with macroeconomic variables based on the date of bond issue or loan contract signing. To avoid endogeneity of debt-related macroeconomic variables,

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<sup>24</sup>According to this practice, private borrowers cannot obtain a rating that is better than rating of their sovereign.

Therefore, if sovereign rating is speculative, we will assume that individual firm’s bonds cannot be investment grade.

<sup>25</sup>Only about 10% are bilateral loans. Excluding those from estimation did not affect the results.

they are included as of the period immediately preceding a given bond issue or loan contract.<sup>26</sup> Simultaneity bias can still arise for sovereigns, since macroeconomic policies and borrowing needs can be determined by the macroeconomic situation in the country. This possibility is taken into account when discussing the results of the estimation and is tested for as a part of the robustness tests.

The macroeconomic data combines variables from IMF and World Bank publications,<sup>27</sup> credit ratings from Institutional Investor, external debt data from the Bank for International Settlements, and daily US interest rate series provided by the Federal Reserve Board. For some countries in the sample, many macroeconomic variables are missing. As a result, out of the 74 countries in the intersection of Bondware and Loanware data sets, only 58 participate in most regressions. The variables for Brady-type and non-Brady-type debt rescheduling are constructed from the World Bank Global Development Finance publications.

### 3.2 Sample characteristics

All bonds and bank loans considered in the analysis are issued as foreign debt and therefore are offered to foreign investors, and, as a rule, are denominated in foreign currency. Table 1 summarizes main characteristics of the data. Two thirds of the bonds bear fixed interest rate, while the bank loans all bear floating rate. Bonds and bank loans have similar maturity distribution with a median of 5 and 4 years respectively. This suggests that bond holders do not engage in monitoring by forcing the borrowers to roll over their debt frequently.

Table 2 presents means and standard deviations of explanatory variables by the ownership sector and debt instrument subsamples. Standard deviations are in parenthesis and are omitted for

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<sup>26</sup>Period can be from one quarter to one year depending on data availability. Flow variables and rates are annualized.

<sup>27</sup>See Data Appendix for complete list of variables, their sources and frequencies.

Table 1: Bond and loan characteristics

	Loans	Bonds	IG bonds	SG bonds	Unclass.	All observations
Observations	12696	3757	1033	2045	679	16453
Of those:						
Private firms	65%	62%	33%	67%	92%	64%
Sovereigns	3.4%	18%	27%	20%	0%	7%
Public entity	32%	19%	40%	13%	8%	29%
Denom. in US \$	78%	55%	54%	72%	7%	73%
Denom. in DM/Euro	3%	9%	10%	10%	1%	5%
Denom. in Yen	2%	8%	20%	5%	2%	4%
other currency	16%	7%	10%	6%	6%	14%
Offshore issue	9%	15%	11%	15%	20%	10%
Floating rate	100%	33%	33%	33%	33%	87%
Median maturity	4 yrs	5 yrs	5 yrs	5 yrs	5 yrs	5 yrs
Mean maturity	4.9 yrs	6.4 yrs	7.5 yrs	5.8 yrs	5.7 yrs	5.2 yrs

dummy variables. Summary statistics are computed with weights. Summary statistics for the macroeconomic variables that were considered, but not included in the final specification are also reported. For a given country and quarter, country variables do not vary across observations: the differences are due to the fact that the number of each instrument issued by each sector varies from quarter to quarter, thus, the means are different.

Investment grade bonds were mostly issued when and where the credit rating residual was high, while speculative grade bonds were issued when and where the credit rating residual was low. We can also see that speculative grade bonds are issued in countries and quarters with higher debt and debt service ratios than investment grade bonds, especially by private borrowers. However, these differences in means are not statistically significant. In most other variables differences in means are not very prominent. Interestingly, sovereigns and other public borrowers from the countries that rescheduled their debt in the previous year were able to issue investment grade bonds, while private borrowers were not.

Table 2: Means and standard deviations computed with weights

	Sovereign			Public			Private		
	IG	L	SG	IG	L	SG	IG	L	SG
Credit rating	2.5	-1.0	-4.7	6.7	-0.3	-1.6	2.3	0.1	-2.3
residual	(9.4)	(9.7)	(9.8)	(8.1)	(10)	(8.4)	(10)	(11)	(9.6)
Foreign debt/ GDP	0.41	0.46	0.39	0.29	0.43	0.39	0.30	0.40	0.40
	(0.17)	(0.24)	(0.15)	(0.18)	(0.32)	(0.18)	(0.15)	(0.27)	(0.19)
Debt service/ exports	0.27	0.24	0.32	0.18	0.22	0.34	0.16	0.21	0.32
	(0.16)	(0.17)	(0.19)	(0.18)	(0.19)	(0.20)	(0.15)	(0.17)	(0.20)
Export growth	0.12	0.12	0.13	0.09	0.11	0.10	0.10	0.11	0.10
volatility	(0.09)	(0.11)	(0.11)	(0.06)	(0.09)	(0.07)	(0.05)	(0.09)	(0.07)
Total/Short	0.45	0.53	0.52	0.60	0.53	0.54	0.55	0.55	0.52
term debt	(0.16)	(0.16)	(0.11)	(0.17)	(0.17)	(0.12)	(0.18)	(0.18)	(0.13)
Real exch. rate	-0.1	-0.6	-0.2	-0.1	-0.5	-1.6	-0.1	-0.3	-1.6
depreciation	(0.1)	(3.2)	(0.3)	(0.1)	(2.3)	(5.0)	(0.1)	(2.0)	(5.2)
Brady deal	0.01	0.02	0.03	0.00	0.01	0.06	0.00	0.02	0.07
Non-Brady deal	0.05	0.06	0.17	0.02	0.08	0.26	0.00	0.08	0.18
CA/GDP	-7.1	-4.1	-6.1	-4.5	-7.5	-6.4	-7.6	-6.9	-4.1
	(15)	(15)	(13)	(14)	(15)	(11)	(15)	(16)	(14)
Reserves/Short	2.1	1.9	1.8	1.5	2.1	1.6	2.3	2.1	1.4
term debt	(3.0)	(2.0)	(1.7)	(1.5)	(2.1)	(1.5)	(3.1)	(2.4)	(1.3)
Reserves/import	1.6	1.5	2.1	1.4	1.6	2.3	1.7	1.8	2.2
	(0.85)	(1.2)	(1.4)	(0.76)	(1.2)	(1.3)	(0.98)	(1.4)	(1.3)
Reserve gain in	0.10	0.08	0.07	0.05	0.05	0.05	0.05	0.03	0.06
last quarter	(0.22)	(0.23)	(0.22)	(0.16)	(0.23)	(0.16)	(0.12)	(0.21)	(0.18)
Growth rate of	0.04	0.06	0.07	0.05	0.06	0.12	0.06	0.06	0.11
domestic credit	(0.05)	(0.10)	(0.07)	(0.04)	(0.09)	(0.22)	(0.05)	(0.08)	(0.20)
Log real	2.6	2.7	2.8	2.4	2.5	2.7	2.3	2.5	2.7
interest rate	(0.56)	(0.76)	(0.71)	(0.69)	(0.72)	(1.1)	(0.76)	(0.74)	(1.0)
Banking system	1.6	1.1	0.86	2.6	1.5	1.2	1.7	1.6	1.4
assets/GDP	(1.2)	(0.94)	(0.60)	(1.8)	(1.3)	(0.96)	(1.6)	(1.5)	(1.1)
Log inflation	-2.2	-1.9	-2.1	-2.7	-2.1	-2.0	-2.6	-2.3	-1.9
rate	(1.1)	(1.4)	(1.5)	(0.9)	(1.4)	(2.0)	(1.1)	(1.4)	(1.9)
US 10-year	6.4	6.5	6.1	6.3	6.5	6.2	6.1	6.3	6.4
Treasury rate	(0.8)	(0.8)	(0.7)	(0.7)	(0.9)	(0.7)	(0.7)	(0.9)	(0.7)
Maturity	8.1	6.6	6.8	7.2	5.3	5.1	6.6	4.8	5.9
	(7.5)	(5.2)	(6.6)	(7.8)	(3.9)	(3.9)	(6.8)	(3.5)	(5.1)
Log amount	5.4	4.4	5.6	4.9	4.1	4.6	4.5	3.5	4.3
	(0.8)	(1.4)	(0.8)	(0.9)	(1.2)	(0.8)	(0.9)	(1.2)	(0.8)
US Dollar	0.43	0.71	0.53	0.53	0.78	0.73	0.62	0.75	0.74
Deutsche Mark	0.12	0.02	0.18	0.09	0.05	0.06	0.11	0.06	0.06
Euro	0.08	0.02	0.10	0.05	0.01	0.08	0.09	0.01	0.01
Yen	0.25	0.09	0.10	0.17	0.04	0.06	0.03	0.00	0.01
Finance industry				0.54	0.20	0.51	0.68	0.30	0.64
Service industry				0.01	0.16	0.02	0.05	0.10	0.06
Manufacturing				0.03	0.13	0.01	0.14	0.32	0.17

Table 3: Coefficient on credit rating in univariate regression

	(1) Ordered probit	(2) IG bond vs. loan	(3) SG bond vs. loan
Private sector	-0.014*** (0.002)	0.011** (0.005)	-0.14*** (-0.003)
Sovereign	-0.033*** (0.005)	0.025*** (0.006)	-0.20*** (0.007)
Public entities	-0.022*** (0.003)	0.031*** (0.004)	-0.009** (0.004)

Dependent variable in (1) is equal to 0 for IG bond, to 1 for bank loan and 2 for SG bond; in (2) and (3) dependent variables are equal to 1 for a bond and 0 for a bank loan.

\* = significant at 10% level, \*\* = significant at 5% level, \*\*\* = significant at 1% level.

Standard errors are in parentheses.

Another observation is that whether the US Treasury rate is low or high does not seem to affect the instrument debt composition — there are no systematic differences in the Treasury rate for different instrument issuance. Finally, one can see that investment grade bonds tend to be of longer maturity than either loan or speculative grade bonds, which is expected.

Table 3 offers simple correlations between credit rating and the debt instrument composition. These are obtained by estimating a regression with credit rating as the only explanatory variable. The first column represents an ordered probit regression, columns two and three represent the results of binary probit regressions of investment grade bond versus loan and speculative grade bond versus loan respectively. The results support the main prediction of the model — higher credit ratings (which implies lower risk) has a correct sign in the ordered model. It also increases the probability of an investment grade bond being issued versus a bank loan and lowers the probability of a speculative grade bond issue versus a bank loan, as expected. These coefficients are significant at 5% confidence level for all ownership sectors. Including  $Y$  and  $Z$  variables, as we will in the analysis below, does not alter these results (in fact, it improves the significance and slightly raises the magnitude of some coefficients).

## 4 Empirical Results

Estimation is conducted separately for each of three ownership types: private, sovereign, and other public borrowers, allowing for different threshold points and different coefficients on explanatory variables for different ownership sectors. As one can see, the results for public borrowers are generally in-between those for private firms and those for sovereigns, as one would expect. Thus, these results are presented but are not discussed in detail. To interpret coefficients in the ordered model, one can think of risk level being a latent variable, thus, we would expect positive coefficients on the variables that increase risk level.

### 4.1 Impact of macroeconomic fundamentals

Table 4 reports the results of estimating the main specification. Since we are interested in the effects of macroeconomic fundamentals that in turn affect credit rating, the credit rating itself is not included, instead the credit rating residual is used as described above. Marginal effects are computed for each outcome of the ordered probit regression and reported in Table 5. They represent the derivative of the probability of a given outcome with respect to the explanatory variable. They are evaluated at the mean of independent variables using the coefficients from ordered probit regression. For binary variables, the marginal effects are the effects of the change of the variable from 0 to 1 on the probability of a given outcome.

Most results are as expected. Note that the coefficients in the regression for the sovereign borrowers have lower significance level. This is partly due to a smaller number of observations for the sovereigns. It also suggests that the model does not do as well in explaining sovereign debt instrument composition. This finding is confirmed below in the analysis of the predictive power of the model.

A higher credit rating residual has the expected sign in all three regressions (higher credit rating



Table 4: Ordered probit results

	Private sector	Sovereign	Public entities
Credit rating residual	-0.014*** (0.005)	-0.042*** (0.013)	-0.023*** (0.005)
Foreign debt/GDP	-0.10 (0.33)	0.43 (0.85)	0.20 (0.35)
Debt service/Exports	1.68*** (0.43)	1.16 (0.94)	1.07 (0.69)
Export growth volatility	-0.94** (0.44)	1.77* (0.97)	0.92* (0.50)
Short-term/Total foreign debt	-0.20 (0.35)	0.90 (0.99)	-0.20 (0.31)
Real exchange rate depreciation	-0.045*** (0.007)	-0.016 (0.035)	-0.082*** (0.014)
Brady-type debt rescheduling	0.67*** (0.26)	0.76* (0.39)	0.77** (0.31)
Non-Brady type debt rescheduling	0.49*** (0.13)	0.64 (0.40)	0.59*** (0.19)
US 10-year Treasury rate	0.080* (0.043)	-0.086 (0.074)	-0.084* (0.047)
Log amount	0.11** (0.051)	0.14* (0.078)	-0.055 (0.073)
US Dollar denominated	-0.35** (0.14)	0.26 (0.21)	0.27 (0.19)
Deutsche Mark/Euro denominated	-0.44** (0.21)	0.56** (0.28)	0.02 (0.24)
Yen denominated	-0.64** (0.28)	-0.20 (0.20)	-0.10 (0.24)
Finance industry	0.30** (0.15)		-0.000 (0.15)
Service industry	0.19** (0.08)		0.13 (0.10)
Manufacturing industry	0.06 (0.09)		-0.14 (0.09)
Actual observations	9166	857	4022

Dependent variable is equal to 0 for IG bond, to 1 for bank loan and 2 for SG bond;

\* = significant at 10% level, \*\* = significant at 5% level, \*\*\* = significant at 1% level.

Robust standard errors corrected for the first stage and clustered by country are in parentheses.

Table 5: Marginal effects (percentage points)

	Private sector	Sovereign	Public entities
Effects on the probability to issue an investment grade bond			
Credit rating residual	0.08***	1.4***	0.29***
Foreign debt/GDP	0.57	-14.8	-2.5
Debt service/Exports	-9.4***	-39.9	-13.1*
Export growth volatility	5.3	-60.8*	-11.3
Short term/Total foreign debt	1.1	-31.0	2.4
Real exchange rate depreciation	0.25***	0.53	1.0***
Brady-type debt rescheduling	-2.0***	-20.0**	-5.3***
Non-Brady-type debt rescheduling	-1.8***	-18.3*	-4.9***
US 10-year Treasury rate	-0.44	3.0	1.0*
Log amount	-0.63***	-4.7**	0.67
US Dollar denominated	1.7***	-9.0	-3.6
Deutsche Mark/Euro denominated	3.6	-16.7***	-0.21
Yen denominated	6.6	7.0	1.4
Effects on the probability to issue a bank loan			
Credit rating residual	0.15**	0.051	-0.050
Foreign debt/GDP	1.1	-0.53	0.43
Debt service/Exports	-18*.0**	-1.4	2.3
Export growth volatility	10.1**	-2.2	2.0
Short term/Total foreign debt	2.2	-1.1	-0.42
Real exchange rate depreciation	0.48***	0.019	-0.17
Brady-type debt rescheduling	-13.8*	-9.4	-8.3
Non-Brady-type debt rescheduling	-8.3**	-6.4	-4.0
US 10-year Treasury rate	-0.86*	0.11	-0.18
Log amount	-1.2*	-0.17	-0.11
US Dollar denominated	4.7*	-0.21	1.2
Deutsche Mark/Euro denominated	2.0**	-4.7	0.03
Yen denominated	0.11	-0.22	-0.39
Effects on the probability to issue a speculative grade bond			
Credit rating residual	-0.23***	-1.5***	-0.24***
Foreign debt/GDP	-1.7	15.4	2.0
Debt service/Exports	27.4***	41.4	10.8
Export growth volatility	-15.4**	62.9*	9.3*
Short term/Total foreign debt	-3.3	32.2	-2.0
Real exchange rate depreciation	-0.73***	-0.55	-0.83***
Brady-type debt rescheduling	15.9*	29.4**	13.6
Non-Brady-type debt rescheduling	10.2***	24.7	8.9**
US 10-year Treasury	1.3*	-3.1	-0.85*
Log amount	1.8**	4.8	-0.56
US Dollar denominated	-6.3**	9.2	2.4*
Deutsche Mark/Euro denominated	-5.6**	21.5*	0.18
Yen denominated	-6.7***	-6.7	-0.98

Marginal effects at the mean values of explanatory variables using coefficients in Table 4.

\* = significant at 10% level, \*\* = significant at 5% level, \*\*\* = significant at 1% level.

residual implies lower risk). The effect is strongly significant and is especially large for the sovereign borrowers. If credit rating residual increases from -4.7 (average for sovereigns issuing speculative grade bonds) to 2.5 (average for sovereigns issuing investment grade bonds), the probability of issuing a speculative grade bond will decrease by about 7.2 percentage points (due to similar increase in the probability of issuing an investment grade bond), while for private borrowers the effect is only 0.6 percentage points. Thus, the credit rating residual appears to be more important when assessing the risk of sovereign debt as compared to private debt. This result is expected: the residual is based on the sovereign credit rating, which is a better description of the risk associated with lending to a sovereign than it is of a risk associated with lending to a private company.

The ratio of foreign debt to GDP has the predicted effect in the regressions for sovereign and public borrowers, although the coefficients are not significantly different from zero.<sup>28</sup> The ratio of debt service to exports, a more short-run measure of indebtedness, has a predicted effect, significant for private borrowers. It appears that the level of debt does not have an impact on the debt instrument composition, while potential aggregate liquidity problems, as measured by a high value of debt service to exports ratio, make borrowers more likely to issue speculative grade bonds rather than investment grade bonds and bank loans. The effect is rather large: an increase in the ratio of debt service to exports by one standard deviation (0.2-0.3) raises the probability of issuing a speculative grade bond by 5.1-5.4 percentage points for private borrowers (mostly due to a decline in the probability of a loan).

Export volatility has a predicted sign in the regression for sovereign and public borrowers, while the sign is the opposite in the regression for private borrowers. There is an explanation for this: higher export volatility increases the probability that the borrower will take out a bank loan rather

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<sup>28</sup>Recently, Reinhart, Rogoff, and Savastano (2003) have shown that the effect of foreign debt to GDP ratio on credit rating is non-linear. Possibly, this explains the lack of significance in the above regression.

than issue a bond (whether speculative or investment grade). This is confirmed by the analysis of marginal effects. Possibly, when exports are more volatile, the level of moral hazard is higher, at least for the borrowers in exporting industries.<sup>29</sup> Thus, within the framework of the model, export volatility does not seem to affect perceived country risk as some previous research suggested (see, for example, Eichengreen, Hale, and Mody (2001)), that considered the bond market in isolation. Instead, higher export volatility might lower bond issuance or increase bond spreads due to added moral hazard and substitution towards bank loans.

Export volatility would not have the same moral hazard effect for sovereign borrowers as it would have for private borrowers. This is shown clearly in the results — the signs of the coefficients imply that higher export volatility increases perceived country risk for investors lending to sovereigns and to public entities. Export volatility might be a much more important variable for those investors that lend to sovereigns, as it is closely related to the volatility of foreign reserves of the central bank. An increase by one standard deviation of export volatility (0.1) will increase probability that a sovereign issues a speculative grade rather than investment grade bond by 6.3 percentage points.

A ratio of short-term to total foreign debt does not seem to have a significant effect on the debt instrument composition. Alternative specifications, not reported here, included the ratio of foreign reserves to short-term debt and the ratio of reserves to imports, but none of these variables seem to matter. Possibly, the ratio of debt service to exports already incorporates investors' estimate of liquidity risk. See further discussion of the robustness below.

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<sup>29</sup>If the exporters do not undertake an effort to reduce the risk of their projects, aggregate exports will be more volatile. In addition, if the exports are volatile for some exogenous reason, exporters will be more inclined to blame this volatility for their failure and thus less likely to undertake a costly effort to reduce the riskiness of their project. This, according to Diamond (1991) should result in increased borrowing from banks. Unfortunately, there is no information on individual firms' exporting activities to further test this result.

By construction, an increase in the real exchange rate index implies real depreciation. Thus, we should expect that the decline in this variable (real appreciation) increases perceived country risk due to a higher chance of a currency crisis. The results support this prediction in all regressions, although the effect is not very large in magnitude.

Having a history of debt rescheduling is expected to increase perceived risk. Since some debt rescheduling arrangements included conversion of debt into guaranteed bonds (Brady-type deals), they might in addition have increased the probability that (any) bond will be issued by creating or expanding the secondary market for bonds. Private borrowers from the countries that had Brady-type arrangements in the previous four quarters never issued investment grade bonds, therefore, for them the coefficient on Brady-type arrangements is identified by the difference between speculative grade bonds and bank loans. A Brady-type deal increases the probability that a private borrower issues a speculative grade bond by 16 percentage points, while a non-Brady-deal increases that probability by 10 percentage points. In both cases the probability of an investment grade bond declines by about 2 percentage points and the rest is due to a decline in the probability of a bank loan. We can see that the probability of a speculative grade bond being issued increases, but we cannot disentangle whether it is due to higher risk perception or due to an increased liquidity of the secondary bond market. We might expect that both effects contribute, as the coefficients are larger in magnitude for Brady-type-rescheduling than they are for non-Brady-type rescheduling.

While the coefficient for the sovereign borrowers is less significant, it is higher in magnitude than the coefficient for private borrowers. For sovereigns, Brady-type rescheduling increases the probability of issuing a speculative grade bond by 29 percentage points (20 from investment grade bond and 9 from bank loans), while non-Brady rescheduling increases the probability of a speculative grade bond by 25 percentage points (18 from investment grade and 7 from loans). Thus, a perceived risk effect of debt rescheduling is very large and clearly dominant for the sovereigns.

A higher US Treasury rate is expected to reduce total lending and increase the share of bank loans. Since those who did not borrow are not in the data set, the first prediction cannot be addressed directly. However, it should be observationally equivalent to a higher risk level of all the borrowers and thus, we would expect the coefficient to be positive. This is indeed the case (borderline significant) for private borrowers, but not for sovereigns and public borrowers. The prediction of increased share of bank loans overall is borne out by the data, as shown by marginal effects. However, this effect is not significant and is small in magnitude.

Issue-specific variables are included to control for borrower composition. The coefficients on these variables seem to have reasonable signs. An increase by one standard deviation in the amount borrowed increases the probability that a speculative grade bond is issued by about 2 percentage points. Since bond issues are harder to arrange than bank loans, borrowers that do not need to borrow as much are more likely to borrow from the bank, other things being equal. The effect of the amount on the probability of investment grade bond is negligible. If the debt is denominated in strong currency (Dollar, Mark or Yen — the control group being ‘other’ currency), it is perceived as less risky, as expected. Private borrowers in all industries other than utilities and infrastructure (control group) are more likely to issue speculative grade bonds rather than bank loans, while the industry is not important for public entities.<sup>30</sup>

Importantly, a binary probit regression of all the bonds combined against the bank loans does not reveal any significant effects of macroeconomic variables considered.<sup>31</sup> This suggests that it is not appropriate to view investment grade and speculative grade bonds as the same instrument. Since

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<sup>30</sup>Lower perceived risk of the utilities and infrastructure firms is most likely due to the fact that this category includes, among others, oil companies, refineries and pipelines as well as international freight companies, which are less subject to country and currency risks.

<sup>31</sup>The results of binary probit regression are not reported. They are available from author upon request.

the same variable can increase the probability of issuing a bank loan versus a speculative grade bond, and increase the probability of issuing an investment grade bond, rather than bank loan, the effect would be a wash in the regression that pools all the bonds together. This provides a further confirmation of the validity of the Diamond (1991) model.

## 4.2 Robustness tests

A number of robustness tests was conducted to make sure the results established in the previous section are robust. The results of these robustness tests are summarized below, but not reported — they are available from the author upon request.

First, the model was re-estimated with logistic instead of normal distribution of the errors. This did not influence the results at all. In addition, binary probit (and logit) regressions were conducted similar to those in Table 3. For most of the variables the coefficients have signs that are consistent both with the effects in the ordered probit regressions and with each other, i.e. if an increase in a given variable increases the probability of obtaining an investment grade bond rather than a bank loan, it also tends to increase the probability of obtaining a bank loan rather than a speculative grade bond.<sup>32</sup> This explains why in a binary regression that combines investment grade and speculative grade bonds in one category, the coefficients are not significant.

Another set of tests was conducted within the ordered probit specification by using un-weighted regressions. Most coefficient (all significant coefficients) remain within the same confidence interval and retain their significance level. All regressions were initially estimated with credit rating residual resulting from an OLS weighted regression as described in Appendix 2. The regressions were re-estimated using residuals from a panel regression estimation and from un-weighted regression. The

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<sup>32</sup>There was one exception: the amount borrowed on the bond market, per issue, tends to be larger than the amount borrowed from a bank, per loan, regardless of the bond rating.

results are not sensitive to these changes.

While a lot of debt rescheduling episodes occurred in Latin America, the debt rescheduling variables do not just proxy for this region. A robustness test was conducted with all the regression re-run with dummy variables for Latin America and East Asia included — the coefficients on debt rescheduling do not change by much and become even more significant for all three regressions. Therefore, the effects of both Brady and non-Brady type arrangements are important above and beyond their correlation with the regional pattern of the borrowers. The same is true for most other variables considered — the effects become more significant and some become larger in magnitude when dummy variables for Latin America and East Asia are included.

In addition, different sets of explanatory variables were considered. In general, variables that tend to describe similar characteristics of the economy tend to have a similar effect on the perceived country risk. In particular, higher ratio of reserves to short-term debt and a larger reserve gain (included one at a time) tend to lower the perceived risk, as expected, but the coefficient is only significant for the private borrowers or for sovereign borrowers, respectively. A higher growth rate of domestic credit significantly increases perceived risk for sovereign borrowers, which is expected — growing domestic credit clearly indicates the government’s problems.<sup>33</sup> Variables such as the rate of real GDP growth, the ratio of reserves to imports, the ratio of current account to GNP (unless the real exchange rate depreciation is excluded), level of domestic credit, real interest rate, inflation rate, and the stock of banking system assets as a share of GDP do not have a significant effect and do not affect other coefficients and the predictive power of the regression.

Finally, additional bond characteristics were included. Including maturity, in logs or levels, as

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<sup>33</sup>The coefficient on this variable for sovereign borrowers debt instrument composition is significant economically and statistically. It also improves a bit the predictive power of the model for the sovereign. This variable is not included in the main specification due to missing data, which leads to a reduction in a sample size.



Table 6: Share of variance in the data explained by ordered regression

	Overall	Across countries	Over time
Private sector	14%	26%	4%
Sovereign	0.2%	0.7%	0.2%
Public enities	8%	8%	1%

The numbers reported are overall, between and within  $R^2$  in the RE regression of the actual share of bond on predicted share of bonds and a constant term.

The data used are formatted as country–quarter panel.

Fixed effect regressions produce the same set of  $R^2$ .

Note: The numbers reported are overall, between and within  $R^2$  in the random effect regression of the actual share of bond on predicted share of bonds and a constant term. The data used are formatted as country–quarter panel. Fixed effect regressions produce the same set of  $R^2$ .

a control variable, does not affect the results. This is expected since maturity distribution of bonds and loans is quite similar in the sample. A dummy variable for bonds and loans placed through off–shore centers was included: its coefficient is positive but not significant and the rest of the coefficients are not affected. Therefore, it appears that investors are sophisticated enough to determine true nationality of the borrower even in these cases.

### 4.3 Predictive power

To see if the ordered probability model has a good predictive power, two variables are constructed: the share of the number of bond issues (sum of investment and speculative grade bonds) in the total number of bond and loan issues by quarter and country in the data,<sup>34</sup> and the ratio of predicted probability of a bond issue (either investment grade or speculative grade) to predicted probability of a bank loan from the estimation, for each quarter and country.

<sup>34</sup>The ratio constructed with amounts borrowed rather than the number of issues are only slightly different and the results described below still hold qualitatively.

Table 6 shows the share of the variance in the data explained by the model. One can see that the model predictions explain some of the variance over time and across countries for private and, to a lesser extent, for public borrowers, but not for sovereigns. In all the robustness tests described above, different sets of explanatory variables explain the maximum of 16% of overall variation in the share of bonds in total lending for private borrowers, 10% for public entities and 0.8% for the sovereigns.

There are two possible explanations for the failure of the model for the sovereigns: first, there are potential endogeneity problems in the estimation and therefore regression coefficients can be biased; second, it could be that the model is not suitable for explaining the debt instrument composition for the sovereigns.

In order to further investigate the endogeneity problem that the regression for sovereign borrowers might exhibit, macroeconomics explanatory variables were lagged by additional one, two and three quarters. The coefficients remained very close and significance level and predictive power were actually reduced in the regressions with lagged macro variables. In addition, a two-stage model was estimated with domestic macroeconomic variables instrumented by CPI, import and export prices, interest rates, real exchange rates and foreign assets in the US, Germany, France and Japan.<sup>35</sup> Predicted values from the first-stage panel regression were then used in the second-stage ordered probit regression. Most coefficients are unchanged, including the coefficients on currency denomination of the debt, with the following exceptions: predicted export volatility has a negative effect, albeit the coefficient is not significant; predicted real exchange rate depreciation is still negative,

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<sup>35</sup>The countries were chosen based on the currency denomination of the majority of bonds and loans for each country. Variables that were highly correlated across countries were excluded. Predicted values were constructed as a sum of fixed effects and  $X\beta$ . Using random effects instead did not make a difference. Data used were quarterly. All associated regressions are available from author upon request.

but is now significant; coefficients on debt rescheduling change significance level. The predictive power of this model is slightly better, but still quite poor: the model now explains 1% of overall variance, 3% of cross-country variance and 0.4% of over-time variance.

This additional analysis suggests that while there is some evidence of endogeneity problem, the model failure to explain debt instrument composition for sovereign borrowers is not merely a result of misspecification of econometric model. If sovereign borrowers' main objective is different from minimizing the cost of borrowing, our model is not a good description of factors determining sovereign debt composition. In particular, if sovereign borrowers do not choose the lower cost debt instrument, the relationship between the perceived risk and the instrument debt composition breaks down, and we would not expect our empirical model to predict well the debt instrument composition for the foreigners.

It appears that factors other than cost minimization affect whether sovereign borrowers borrow from the bank or on the bond market. These other considerations are not the focus of this paper.

## 5 Conclusion

How do macroeconomic fundamentals affect the instrument composition of foreign debt? One can expect this relationship to be much more pronounced for the EMs because macroeconomic fundamentals affect the debt instrument composition mainly through the effect of country risk, and the ratio of country risk to firm idiosyncratic risk is much higher for EM borrowers. This paper is the first attempt to analyze the relationship between EM debt instruments and macroeconomic fundamentals empirically. The theoretical corporate finance literature provides the structure for empirical tests and intuition for interpretation.

Empirical analysis confirms the predictions of Diamond (1991) and allows us to identify funda-

mentals that do and do not affect country risk and therefore, the composition of debt instruments. In particular, the analysis confirms that the debt service to exports ratio, the degree of the real exchange rate appreciation, the volatility of exports, and the history of sovereign debt rescheduling, among others, affect debt instrument composition in an expected direction and that these effects are economically important.

The model explains private and public borrowers' debt composition quite well. However, for sovereign borrowers the model has little if any predictive power. This is not unexpected — sovereign borrowers are not necessarily minimizing the cost of borrowing, unlike private firms do. This means that they will not necessarily choose the instrument that offers lowest cost of borrowing, which will break the model prediction regarding the relationship between risk and debt instrument.

This is, in a sense, good news for economic policy. If the government is trying to affect the debt instrument that the country primarily relies upon, it can alter its own borrowing. The paper shows that in addition the government can predict the development of private debt structure as a result of conducted macroeconomic policies.

Specifically, the analysis reveals that changes in country credit rating and default on sovereign debt have a large impact on the composition of private borrowers' external debt. This finding is useful for two debates that were prominent in recent literature on developing countries foreign debt: on the role of rating agencies, and on the changes in the sovereign debt restructuring procedures.

Finally, by determining the variables that affect the debt instrument composition, the findings of this paper facilitate empirical analysis of EM debt and open an avenue for further research on the relative importance of the bond market and bank financing to developing countries. While there is a large body of empirical literature on financial contagion, previous studies tend to be limited to either the bond or the loan markets. More rigorous study would require simultaneous analysis

of both markets due to the possibility of substitution between the two instruments (as the effects of export volatility illustrate). This paper therefore can help researchers resolve the question of whether international bonds are safer than international bank loans in times of financial instability.

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## Appendix 1. Debt instrument composition and debt restructuring

The length of debt restructuring was measured by combining official dates of debt restructuring agreements (IMF and WB publications) with news reports about the on-set of debt restructuring negotiations, found using Lexis–Nexis Academic Universe database. The difference between these dates, in months, measure the amount of time it took to reach an agreement. The frequency of restructuring episodes is equal to the number of restructuring episodes in a group of countries considered over total number of country-quarters in that group.

These data were combined with the share of bond debt in the total stock of foreign debt of a country, using *Joint BIS–IMF–OECD–World Bank Statistics on External Debt*. The Table on the next page lists all the countries which had some form of debt negotiations in the 1990s and for which debt stock data were available.

If we split these episodes of debt restructuring by the quartiles of bond share in the total stock of foreign debt, we find the following:

Quartile	Bond share	Length of negotiations (months)		Freq.(restruct.) percent
		average	median	
1st	0	10.6	9	0.85
2nd	(0,0.03]	10.8	10	0.92
3rd	(0.03, 0.19]	7.4	6	0.74
4th	> 0.19	18.1	18	0.61

While there is no clear difference between the amount of time it takes to reach an agreement for the first three quartiles of bond share distribution, it is very clear that if the bond share is high (exceeds 20%), the negotiations take about twice as long. On the other hand, negotiations seems to happen more frequently in the countries and quarters with lower share of bond debt, which is indicated by the numbers in the last column of the table above and the negative (albeit not significant) coefficient of -0.32 (standard error of 0.34) in a probit regression with restructuring indicator on the left-hand side and the share of bonds in this quarter and this country and a constant term as

Country	Negotiations			Stock of debt (mil. USD)		
	began (y, m)		lasted (m)	bond	loan	bond share
Algeria	1993	12	6	516	14286	0.035
Bolivia	1993	4	11	10	311	0.031
	1997	4	18	3	520	0.0057
	2000	2	19	0	1002	0
Brazil	1993	1	15	7815	67923	0.10
Bulgaria	1993	6	10	181	7099	0.025
Dominican Republic	1993	11	9	0	607	0
Ecuador	1992	9	10	15	3221	0.0046
	1999	4	17	6444	3017	0.68
Egypt	1991	3	2	0	5611	0
Ethiopia	1992	5	7	0	290	0
	2000	9	7	0	43	0
Indonesia	1997	10	8	6384	62248	0.093
Jamaica	1992	4	9	0	437	0
Korea	1997	8	5	49412	99462	0.33
Mexico	1994	12	18	52253	64628	0.45
Nigeria	1998	9	27	2051	1660	0.55
Pakistan	1998	8	5	969	7429	0.12
	2000	11	2	314	6078	0.049
	2001	10	2	19	5037	0.0038
Peru	1995	5	14	80	4610	0.017
Philippines	1990	7	11	0	9616	0
Poland	1993	1	21	0	12810	0
Russia	1998	8	3	18627	52786	0.26
South Africa	1993	4	5	1216	12561	0.088
Turkey	1998	7	35	13986	33332	0.30
Ukraine	1999	5	22	1044	1342	0.44

the only explanatory variables.

Although these results do not represent careful analysis of the effect of debt instrument composition on the frequency and length of debt rescheduling (this analysis is a subject of ongoing research), they are indicative of the importance of debt composition.

## Appendix 2. Credit rating residual

The credit ratings of sovereigns tend to be constructed by the rating agencies as a function of macroeconomic variables. Variables that are commonly used include the growth rate of real GDP (a higher growth rate should improve the credit rating), the ratio of total debt service to exports (a lower ratio should improve the credit rating), the ratio of total external debt to GNP (a lower ratio should improve the credit rating), the variance of export growth (a lower variance should improve the credit rating), and the inflation rate (a lower inflation rate should improve the credit rating).

Debt rescheduling typically worsens a country's credit rating.

	Coef.	S.E.
Foreign debt/GDP	-6.38***	1.28
Debt service/Exports	-19.3***	1.59
Export growth volatility	-36.2***	2.99
Log of inflation rate	-2.56***	0.24
Short term/Total foreign debt	16.6***	1.61
Real exchange rate depreciation	-0.0069	0.14
Foreign reserves/Imports	1.58***	0.20
Growth rate of real GDP	176.1***	23.9
Brady type debt rescheduling	-11.7***	1.67
Non-Brady type debt rescheduling	-10.3***	0.88
Constant	37.7***	1.23
Observations	2014	
Adjusted $R^2$	0.47	

Note: \*\*\* = significant at 1% level.

The estimates in the table are from an OLS estimation. The weights are assigned to each observation in such a way that each country in each quarter has the same weight, provided that the country borrowed in the international market in a given quarter.<sup>36</sup> The dependent variable is the credit rating assigned to a country by Institutional Investor (0-100 scale) twice a year. Macroeconomic variables are quarterly. All the variables have predicted signs and are strongly significant. The credit rating residual is then a simple residual from this regression.

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<sup>36</sup>The same regression without weights leads to a predicted credit rating residual that is highly correlated (correlation coefficient is equal 0.97) with the one predicted by the weighted regression.

## Appendix 3.

### Bond classification into investment and speculative grade

Unfortunately, individual bond ratings are available for only a small subset of the bonds. Moody's individual bond ratings are available for only 1951 out of 3757 bond issues.<sup>37</sup> In most cases, the S&P and Moody's rating, when both available, either both assign an investment grade, or both assign a speculative grade to the borrower.<sup>38</sup> There are 139 issues for which issuers are rated by S&P, which provides information for additional 21 bond issues (as 118 issues overlap with those for which ratings are available). Thus, based on available ratings, we can classify 1972 bonds, out of which 819 are investment and 1153 are speculative grade.

Next, sovereign bonds can be classified using sovereign credit ratings. Since Institutional Investor's credit rating does not provide a clear split between investment and speculative grade, and Moody's refused to provide historical data, S&P ratings that are available on the Internet are utilized. Unfortunately, this data is overlapping with existing classification and thus, does not allow us to classify any of the additional bonds.<sup>39</sup>

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<sup>37</sup>The individual bond ratings from Moody's are available for 1945 bonds; additional 6 bonds are classified based on Moody's issuer rating that is available for 256 bond issues with 250 bonds for which individual ratings are also available. Except for 11 issues, whenever a bond is assigned an investment grade, the issuer is also assigned an investment grade and vice versa. For 11 issues, the issue is rated "Baa3" while the issuer has a one-notch-lower rating — "Ba1". The boundary between investment grade and speculative bonds lies just between those two grades. I classify those 11 issues as non-investment grade, due to the fact that, when the S&P rating for the same issuers is available, it is a non-investment rating.

<sup>38</sup>There are 13 bonds for which S&P assigned non-investment grade while Moody's assigned investment grade and 5 bonds for which Moody's assigned non-investment grade and S&P assigned investment grade. I rank those bonds according to Moody's as individual bond ratings are more precise than issuer's ratings.

<sup>39</sup>There are 195 sovereign bonds for which S&P sovereign ratings do not agree with the classification described above. Since sovereign ratings are somewhat imprecise (by construction of my data set they are only changed

There are two ways to classify the rest of the bonds. First, would be to use the so-called “sovereign ceiling” practice, when rating agencies do not assign private ratings that exceed the rating of their sovereign. Assuming that no borrowers in a country could issue an investment grade bond if their sovereign is assigned a non-investment rating, additional 518 bonds that were not classified before can be classified as speculative grade.<sup>40</sup> The sovereign ceiling does not allow us to classify any bonds as investment grade. Now 2490 bonds are classified: 819 are investment and 1671 are speculative grade.

This information can be extrapolated in order to determine for the majority of still unclassified bonds if they are investment or speculative grade bonds. First, a binary variable that takes up a value of 1 if the assigned rating is investment grade and 0 otherwise is constructed.<sup>41</sup> We then fit a probit model using available data on issuers. The results reported in Table 7 are used to predict the probability that the bond is investment grade. A bond is classified as investment grade bond if the predicted probability for this bond is more than 0.5, otherwise a bond is classified as speculative.<sup>42</sup> For 1644 bonds that are already classified this procedure provides correct classification, while 364 bonds are misclassified. Given that in 82% of the cases this procedure gives the right answer, it seems to be useful for classifying the remaining bonds. This procedure allows to classify additional 214 bonds as investment grade and additional 374 bonds as speculative grade — for a total of 3078 bond issues classified.

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quarterly), I stick to the previous classification. For 363 sovereign bonds, both measures lead to the same results.

<sup>40</sup>I choose not to impose the sovereign ceiling when individual ratings are available. As S&P claim, they are “less likely than other agencies to use sovereign ceiling”.

<sup>41</sup>To make this as clean as possible, I only use the individual Moody’s bond ratings that are available for 1951 bonds.

<sup>42</sup>For sensitivity tests we also estimate separate probit regressions for each ownership sector and construct separate predictions for each ownership sector. The results are presented in Table 7.

Table 7: Probit regression used to classify bonds

	All	Private	Public	Sovereign
Credit rating	0.019*** (0.004)	0.010* (0.006)	0.033*** (0.007)	0.065*** (0.011)
Spread	-0.003*** (0.000)	-0.004*** (0.001)	-0.002*** (0.001)	-0.003*** (0.001)
Guarantee	0.27** (0.13)	0.15 (0.18)	0.54** (0.24)	-0.43 (0.44)
UK governing law	-0.49*** (0.091)	-0.82*** (0.31)	-0.74*** (0.19)	-0.35 (0.22)
US governing law	-0.096 (0.14)	-0.35 (0.28)	-0.47 (0.32)	-0.13 (0.23)
Issue in DM	0.12 (0.16)	0.56 (0.38)	1.16*** (0.35)	-0.60** (0.26)
Issue in Euro	0.21 (0.17)	1.097*** (0.41)	0.34 (0.57)	-0.45* (0.24)
Issue in Yen	0.37*** (0.14)	0.13 (0.35)	0.50** (0.23)	0.012 (0.23)
Finance industry	-0.35 (0.26)	-0.65*** (0.19)	0.52 (0.36)	
Manufacturing	0.25 (0.29)			
Government services	-1.10*** (0.35)			
Utility/Infrastructure	-0.041 (0.27)	-0.79*** (0.25)	1.33*** (0.39)	
Service	-0.27 (0.30)			
Public (non-sovereign) borrower	-0.73*** (0.24)			
Private borrower	-1.70*** (0.25)			
Constant	1.11*** (0.41)	0.63 (0.55)	-1.50*** (0.58)	-1.62*** (0.53)
Observations	1612	650	395	546
Log likelihood	-752.1	-254.3	-183.1	-262.2
Pseudo $R^2$	0.30	0.26	0.31	0.28

Binary dependant variable =0 for speculative grade bond, =1 for investment grade bond.

\* = significant at 10% level, \*\* = significant at 5% level, \*\*\* = significant at 1% level.

Standard errors are in parentheses.

The other 679 bond issues are missing explanatory variables, predominantly spread. For now, they are left unclassified and are not considered in the empirical analysis.

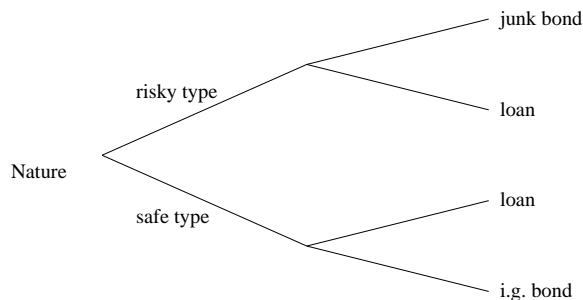


Figure 2: Decision-making

A categorical variable is then created. It is equal to 0 if an investment grade bond is observed, to 1 if a loan is observed, to 2 if a speculative grade bond is observed, and is missing for the bonds that are not classified. Further, we test whether the above classification of bonds is appropriate. According to the model, there are basically two group of borrowers: some can choose between investment grade bonds and bank loans, while others can choose between speculative grade bonds and bank loans. Adding a third choice to each of the groups should not affect the decision, as shown in Figure 2. Thus, if classification is appropriate, we should expect that in multinomial logit estimation assumption of independence from irrelevant alternative (IIA) holds when a second type of bonds is excluded. If loan alternative is removed, however, IIA should fail strongly, as investors do not choose between speculative and investment grade bonds. If the bonds are misclassified, there is no reason why IIA should hold.

Omitted	$\chi^2$	D.of F.	Prob(. > $\chi^2$ )	Evidence
Small-Hsiao (LR) tests of IIA assumption				
I.G. bond	13.3	14	0.51	for Ho
S.G. bond	14.8	14	0.39	for Ho
loan	56.5	14	0.00	against Ho

The results of Small–Hsiao LLR test to test for IIA are reported in the Table above. They strongly suggest that the classification is appropriate: excluding either investment or speculative grade bonds does not change the results, while excluding loans does change them. These results also hold for alternative definitions as mentioned above.



## Data Appendix

The data were collected from the data sources and in the formats described below.

Variable	Source	Units	Frequency
US treasury rate	Federal Reserve	annual %	daily
Credit rating	Institutional Investor	0–100 scale	bi-annual
Debt service	IMF IFS	US\$	quarterly
Exports, imports and CA	IMF IFS	US\$	quarterly, monthly
Real and nom. GDP	IMF IFS	index and n.c.	quarterly
C.B.Reserves	IMF IFS	US\$	quarterly
Domestic credit	IMF IFS	US\$	quarterly
Short-term I.R.	IMF IFS	annual %	quarterly
CPI	IMF IFS	index	quarterly
Exchange rate	IMF IFS	n.c./dollar	quarterly
Inflation rate	IMF IFS	US\$	quarterly
Banking system assets	IMF IFS	US\$	quarterly
External debt (total and sh.t.)	BIS	US\$	bi-annual
Debt rescheduled	WB GDF publications	list	by date of restruct.
Bond data	Bondware		by closing date
Loan data	Loanware		by signing date

Table 11 lists the countries in the data set and the number of observations, as well as the number and amount of bonds and loans for each country. A share of investment grade bonds (relative to the total number of bonds) is derived from the artificial classification of bonds that is not in the original data set. See Appendix 3. Algeria, Barbados, Ethiopia, Ghana, Iran, Jamaica, Lesotho, Liberia, Mauritius, Moldova, Oman, Panama, Qatar, Romania, Saudi Arabia, Seyshelles, Taiwan, United Arab Emirates, and Vietnam also borrowed internationally but are not included in the regression analysis due to missing explanatory variables.

Table 8: Amount (bln. USD) of bonds and loans by country and ownership sector

Country	Private firms		Sovereign		Public entities	
	Bonds	Loans	Bonds	Loans	Bonds	Loans
Algeria*	0	0.19	0	0	0	19.9
Angola	0	0.14	0	0	0	6.34
Argentina	21.4	35.8	52.6	4.06	4.52	9.98
Bahrain	0	1.07	0	0.5	0	7.55
Bangladesh	0	6.59	0	0	0	0.3
Barbados*	0	0.062	0.13	0.036	0	0
Bolivia	0.03	0.71.0	0	0	0	0.1
Brazil	29.36	29.9	15.18	0.076	12.09	14.57
Bulgaria	0.05	0.039	0	0	0.16	0.65
Chile	4.62	22.86	0.5	0.036	0.1	6.05
China	2.77	12.3	5.78	0.58	12.7	63.99
Colombia	1.52	12.09	6.30	2.87	1.30	2.43
Costa Rica	0	0.17	1.5	0	0.15	0
Croatia	0.033	1.56	1.19	0.77	0.14	1.18
Czech Republic	4.83	3.72	0.69	0	3.36	9.48
Dominican Republic	0.6	0.19	0	0	0.12	0
Ecuador	0.61	0.11	0.5	0.088	0.13	0.44
Egypt	0.1	4.40	0	0.049	0	2.27
El Salvador	0	0.80	0.45	0.042	0	0.41
Estonia	0.44	0.41	0.48	0.15	0.084	0.48
Ethiopia*	0	0	0	0	0	0.11
Ghana*	0.25	0.92	0	0.36	0	3.21
Guatemala	0.18	0.60	0.45	0	0	0.11
Hong Kong	33.34	89.71	0	0	5.34	11.19
Hungary	0.27	4.96	18.36	0.48	0.41	6.96
India	3.83	10.70	0	0.21	2.05	18.71
Indonesia	16.50	51.0	0.4	6.45	1.28	8.44
Iran*	0	4.03	0	0.045	0	10.74
Jamaica*	0.24	0.84	0.95	0.36	0	0
Kazakhstan	0.20	0.51	1.25	1.72	0	0.80
Kenya	0	0.11	0	0	0	0.055
Korea	30.23	39.67	4.00	2.42	35.21	13.65
Kuwait	0	0.69	0	13.42	0	7.82
Latvia	0.09	0.11	0.33	0.20	0	0.40
Lebanon	0.89	1.08	7.49	0.30	0.73	0.01
Lesotho*	0	0	0	0.018	0	0.60
Liberia*	0.51	3.10	0	0	0	0.12
Lithuania	0	0.43	0.96	0.76	0	0.49

\* = country was not include in estimation due to missing macroeconomic variables.

Bond and loan data are summarized in Table 10. Note that East Asian borrowers rely mostly on bank loans, while Latin American borrowers rely primarily on bonds. This is consistent with the model's predictions — East Asian borrowers were viewed by investors as relatively low-risk before the Asian crisis.

Table 9: Amount (bln. USD) of bonds and loans by country and ownership sector (cont.)

Country	Private firms		Sovereign		Public entities	
	Bonds	Loans	Bonds	Loans	Bonds	Loans
Malaysia	5.41	33.55	1.19	2.62	7.52	15.15
Mauritius*	0	0.094	0.45	0.064	0	0.40
Mexico	34.62	39.34	31.68	5.84	17.38	35.95
Moldova*	0	0.087	0.29	0	0	0
Morocco	0.30	2.57	1.02	0.58	0	1.56
Nigeria	0	0.68	0	0	0	0.24
Oman*	0	0.79	0.68	3.16	0	4.42
Pakistan	0.045	3.95	0.75	1.80	0.10	7.50
Panama*	0.23	2.27	2.50	0	0	0
Papua New Guinea	0	0.53	0	0.28	0	2.58
Paraguay	0	0.10	0	0.19	0	0
Peru	0.50	6.34	0	0.60	0	0.91
Philippines	7.20	9.73	7.56	9.54	1.92	6.62
Poland	4.87	5.63	0.81	0.30	0.19	5.07
Qatar*	0	2.61	0	5.91	0	14.21
Romania*	0.075	1.81	0.35	0.091	0	3.40
Russia	3.27	6.92	17.0	0.045	1.50	33.25
Saudi Arabia*	0	10.93	0.28	19.33	0	23.24
Seychelles*	0	0.019	0	0.0072	0	0
Singapore	5.56	25.68	0	0	2.63	1.92
Slovak Republic	0.31	9.63	2.38	0.12	0.38	4.00
Slovenia	0	1.086	2.43	1.05	0	0.57
South Africa	2.37	13.71	4.67	0	7.50	4.44
Sri Lanka	0	0.65	0.15	0.20	0.23	1.06
Taiwan*	8.67	36.35	0	0	0.76	1.44
Thailand	11.79	41.74	2.28	0.45	1.93	11.57
Trinidad and Tobago	0.33	3.26	2.04	0.15	0	0.15
Tunisia	0	0.68	2.81	1.22	0	1.18
Turkey	2.09	23.10	23.33	7.64	1.65	10.31
Ukraine	0	0.089	3.44	0	0	0.35
United Arab Emirates*	0	1.50	0	0.026	0	3.65
Uruguay	0.95	0.57	3.23	0.14	0	0.026
Venezuela	5.96	7.98	10.45	1.52	3.16	7.41
Vietnam*	0	0.75	0	0.079	0	2.26
Zambia	0	0.040	0	0	0	1.48
Zimbabwe	0	0.75	0	0.13	0	1.027

\* = country was not include in estimation due to missing macroeconomic variables.

Table 10: Distribution of bonds (first line) and loans (second line) by region for each year

Region	1991	1992	1993	1994	1995	1996	1997	1998	1999	1991-9
	By the amount issued:									
E. Europe and C.Asia	15% 10%	7% 5%	10% 7%	6% 9%	9% 8%	6% 8%	10% 12%	26% 9%	14% 7%	12% 9%
Middle East	4% 29%	15% 26%	7% 15%	5% 18%	7% 16%	5% 9%	5% 13%	8% 16%	10% 20%	7% 17%
E. Asia and Pacific	34% 32%	29% 40%	35% 52%	52% 55%	42% 47%	41% 52%	34% 43%	16% 30%	29% 32%	34% 43%
Caribbean	0% 0.3%	1.4% 0.3%	0.7% 0.1%	1.3% 0.5%	0% 0.1%	0.5% 0.2%	0.6% 1.2%	1.4% 0%	0.5% 0.5%	0.7% 0.4%
Latin America	43% 18%	44% 17%	46% 17%	31% 11%	36% 15%	46% 21%	44% 24%	47% 37%	44% 32%	43% 22%
South Asia	1.7% 2.6%	0% 3.3%	1.0% 4.3%	2.0% 4.7%	1.4% 4.4%	1.3% 4.8%	2.1% 3.9%	0.2% 3.8%	0.1% 3.4%	1.2% 4.0%
Africa	2.4% 8.1%	3.8% 7.8%	0.9% 4.0%	3.5% 2.3%	3.1% 9.9%	1.2% 4.1%	4.4% 2.8%	1.7% 3.6%	2.2% 5.7%	2.6% 5.1%
Total (bln U.S.\$)	13.1 87.5	21.1 74.8	57.5 83.2	55.3 104.4	58.1 150.7	106.5 161.8	136.2 234.7	80.0 130.4	87.6 120.2	615.4 1147.7
	By the number of issues:									
E. Europe and C.Asia	11% 5%	7% 6%	6% 8%	6% 9%	11% 9%	7% 9%	12% 13%	20% 17%	15% 14%	10% 10%
Middle East	2.4% 12%	7% 14%	3% 12%	1.9% 8%	4% 6%	4% 6%	5% 8%	9% 12%	8% 14%	5% 9%
E. Asia and Pacific	45% 55%	29% 52%	35% 53%	52% 60%	53% 60%	50% 63%	42% 52%	16% 36%	39% 37%	42% 53%
Caribbean	0% 1.3%	1.5% 0.6%	0.7% 0.5%	2.1% 0.8%	0% 0.2%	0.9% 0.3%	1.0% 0.6%	2.1% 0%	0.5% 0.4%	1.0% 0.5%
Latin America	39% 15%	53% 18%	53% 16%	34% 11%	27% 13%	35% 12%	36% 17%	50% 26%	36% 26%	38% 17%
South Asia	0.8% 3.4%	0% 3.2%	1.4% 4.3%	2.2% 7.1%	2.0% 5.8%	2.3% 6.7%	3.1% 6.3%	1.0% 4.9%	0.2% 2.9%	1.8% 5.3%
Africa	2.4% 8%	3.0% 6%	0.7% 6%	1.5% 3%	2.2% 4%	0.9% 4%	1.2% 3%	1.7% 4%	1.4% 5%	1.4% 5%
Total	127 924	203 1045	434 1160	481 1371	454 1790	690 1979	669 2182	289 1172	427 1070	3774 12693

Table 11: Amount (bln. USD) and number of bonds and loans by country

Country	N. bonds	N. loans	Am. bonds	Am. loans	% IG in N.	% IG in Am.
Algeria*	0	76	0	20.1	0	0
Angola	0	33	0	6.5	0	0
Argentina	379	401	78.4	49.8	0	0
Bahrain	13	77	0	9.1	8%	0
Bangladesh	0	12	0	0.9	0	0
Barbados*	5	7	0.13	0.10	100%	100%
Bolivia	3	21	0.03	0.81	0	0
Brazil	431	336	56.6	44.5	0	0
Bulgaria	4	15	0.2	0.7	0	0
Chile	44	337	5.2	51.6	68%	81%
China	122	1324	21.2	78.5	66%	76%
Colombia	41	159	9.1	17.4	27%	18%
Costa Rica	9	13	1.6	0.2	0	0
Croatia	11	68	1.4	3.5	82%	93%
Czech Rep.	173	141	8.9	13.2	20%	61%
Dominican Rep.	6	6	0.7	0.2	50%	14%
Ecuador	11	22	1.2	0.6	0	0
Egypt	1	59	0.1	6.7	0	0
El Salvador	3	41	0.4	1.2	100%	100%
Estonia	24	148	1.0	3.5	54%	80%
Ethiopia*	0	3	0	0.1	0	0
Ghana*	1	72	0.3	4.5	0	0
Guatemala	6	15	0.6	0.7	0	0
Hong Kong	563	881	96.2	100.1	56%	63%
Hungary	77	184	19.0	12.4	97%	99%
India	53	420	5.9	29.7	0	0
Indonesia	130	1069	18.1	65.9	4%	2%
Iran*	0	47	0	14.8	0	0
Jamaica*	9	24	1.2	1.2	0	0
Kazakhstan	9	47	1.4	3.0	0	0
Kenya	0	9	0	0.2	0	0
Korea	584	1015	69.5	55.7	46%	72%
Kuwait	0	89	0	22.6	0	0
Latvia	7	29	0.4	0.7	100%	100%
Lebanon	42	30	9.1	1.3	0	0
Lesotho*	0	17	0	0.6	0	0
Liberia*	3	162	0.5	14.3	0	0
Lithuania	10	54	1.0	1.7	0	0

Table 12: Amount (bln. USD) and number of bonds and loans by country (cont.)

Country	N. bonds	N. loans	Am. bonds	Am. loans	% IG in N.	% IG in Am.
Malaysia	62	583	14.1	51.5	65%	82%
Mauritius*	3	21	0.5	0.5	100%	100%
Mexico	345	538	83.7	81.1	42%	64%
Moldova*	5	7	0.3	0.08	0	0
Morocco	7	62	1.3	4.7	0	0
Nigeria	0	25	0	0.9	0	0
Oman*	3	103	0.7	124.4	100%	100%
Pakistan	6	212	0.9	13.2	0	0
Panama*	37	43	2.7	2.3	24%	93%
Papua New Guinea	0	33	0	3.4	0	0
Paraguay	0	9	0	0.3	0	0
Peru	9	101	0.5	7.9	0	0
Philippines	112	242	17.9	19.8	0	0
Poland	28	170	5.9	11.0	39%	44%
Qatar*	2	53	0	22.7	0	0
Romania*	2	85	0.4	5.3	0	0
Russia	45	319	21.8	43.4	0	0
Saudi Arabia*	1	119	0.3	53.5	100%	100%
Seychelles*	0	6	0	0.03	0	0
Singapore	56	324	8.2	27.6	25%	23%
Slovak Rep.	24	110	3.1	5.5	0	0
Slovenia	6	132	2.4	6.3	100%	100%
South Africa	47	163	14.5	18.1	68%	83%
Sri Lanka	9	30	0.4	1.9	0	0
Taiwan*	100	411	9.4	37.8	12%	15%
Thailand	150	916	16.0	53.8	21%	25%
Trinidad & Tobago	17	25	2.4	3.6	71%	67%
Tunisia	15	58	2.8	3.1	100%	100%
Turkey	99	552	27.1	41.1	0	0
Ukraine	10	18	34.4	0.4	0	0
UAE*	0	88	0	8.9	0	0
Uruguay	37	22	4.2	0.7	89%	93%
Venezuela	134	183	30.3	18.7	28%	27%
Vietnam*	0	80	0	30.8	0	0
Zambia	0	76	0	4.5	0	0
Zimbabwe	0	59	0	1.9	0	0

\* = country was not include in estimation due to missing macroeconomic variables.